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No. 158 – April 2009

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http://dipeco.economia.unimib.it

Trade Liberalization and Trade Tax Revenues in African Countries

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Abstract

We empirically investigate the effect of trade liberalization on trade tax revenues applying panel-data methods to a large sample of African countries from the period 1970-2000. The goal of this paper is to determine whether controlling for macroeconomic features of African economies and taking into account the existence of political constraints that might either support or weaken the power of the trade reform, a change in trade policy has a positive or negative effect on trade tax revenues. We find that there exists a large trade off between a greater degree of openness to international trade and the revenue collected from import and export taxation. We document the existence of a Laffer effect between trade openness and trade tax revenues and stress the importance of exchange rate policies along with the stability of the macroeconomic environment in determining trade reform outcomes. Interestingly, we also provide evidence of the relevance of government credibility in explaining trade tax revenues.

*I am grateful to Emilio Colombo and Fabrizio Carmignani for for useful comments and insightful discussions.

1 Introduction

One of the most widely accepted theories in economics claims that there exists a positive relationship between a higher degree of openness to international trade and economic growth. As a consequence, a trade liberalization reform is largely considered as a growth-enhancing strategy because of its positive effect on the promotion of efficiency, the improvement in international competition and the expansion of the trade volume.[1] The last decades have witnessed a large decrease of trade closure altogether, with many countries trying to find new forms of trade agreement under the guidance of international organizations such as the WTO, the IMF and the World Bank. One of the aims of the Doha Round Agenda, for example, was to create new trade opportunities to developing countries following a sharp decrease on their trade barrier level. Despite the clear link between trade and growth and the pressure from the international authorities, a high number of developing and least developed countries (LDCs) is still experiencing a high level of either tariff and non tariff trade barriers. Among many, one of the strongest reasons behind this reluctance to liberalize trade stems from the uncertainty related to the revenue and fiscal consequences following a drastic and needed further reduction in tariff barriers. As shown in figure 1, in the African continent trade tax revenue represents more than 30 percent of the total tax revenue collected.[2] Moreover, as shown in figure 2, revenue obtained from trade taxation represents a very high share of GDP in these countries. This is in line with the results in Khattry and Rao (2002) which show the existence of a strong negative relationship between the share of trade taxes on total tax revenue and the level of development.

A good trade liberalization reform is complex and should consist of different intermediate steps. This is particularly true in developing countries where trade protection is built on several types of trade barriers, ranging from quantitative restrictions to tariff-barriers. This complexity makes any attempt to predict a general final tax revenue outcome a difficult task. In fact, different conclusions can be drawn depending on the timing and the components of a trade liberalisation reform which can vary substantially among economies, depending on their initial conditions, priorities, pressure from lobbies, and ad-

[1] See Ades and Glaeser (1994), and Alesina, Spolaore and Wacziarg (2000), Ben-David (1993), Dollar (1992), Edwards (1992), Krueger (1998), Sachs and Warner (1995).

[2] This result is in line with the one found in a recent studies of the African Trade Policy Center (2004) who claims that in recent years trade tax revenues accounted for about 34 percent of total revenue in the least developed countries of Africa, more than 19 points higher than for developing countries as a whole. In the remaining African non LDCs countries, the share of customs duties to overall revenue is around 22 percent, still higher than the average 15 percent for developing countries.

ministrative ability, (Ebrill et al. 1999). Theoretically, worries about revenue security should represent a serious problem only at the later stage of a trade reform because a sound reform should be sequenced so that initial effort to reduce import barriers focuses on quantitative restrictions (QRs) and other non-tariff barriers (NTBs) in order to mitigate the potential revenue losses or the potential increase in import that could lead to balance of payments problems. Only at a second stage, after securing revenues through measures as tariffication of quotas and after the implementation of a fiscal reform aimed at collecting revenue via domestic taxation, measures to reform import tariffs can be implemented. This procedure would in fact preserve total tax revenue from falling, would strengthen the administrative competence of the government, and would enable the economy to reach higher efficiency which represents the long-run aim of a trade liberalization reform. As suggested by the literature [3], appropriate measures to reform import tariffs consist in reductions in the maximum and higher tariffs rate, reduction in the number of tariff bands, conversion of specific tariffs into ad valorem rates, consolidation of other import taxes or charges into a single rate, and reduction or elimination of tariff exemptions for individuals, organizations, or groups. Nonetheless, the willingness and the ability of a developing country to engage in an effective trade reform represents a difficult task in particular in Africa where the resistance to liberalize trade could be ultimately seen as the result of dramatically low administrative capacity and political will which prevent these countries either from implementing credible fiscal reforms, aimed at broadening the tax base of the domestic economy, and from improving their ability to collect alternative forms of revenues to custom duty ones (that are relatively easy to collect). As explained by Khattry (2001), efforts to liberalize trade may result in revenue losses and may worsen the fiscal deficit if the potential decrease in trade tax revenue is not replaced by revenue from domestic indirect and direct sources (taxes on goods and services and taxes on income and profit). Winters et al. (2001) explain that one of the reasons of the historical popularity of trade protection is that taxation of foreign trade is administratively easier than taxation of domestic goods. This is so because typically foreign trade has a limited number of points of entry into the country. Consequently, focusing taxation efforts on the goods passing through these places can yield considerable revenue for relatively little administrative cost.

The situation of most African economies is also worsen by their chronic fiscal imbalances. In fact, for these countries, any loss of tax revenue due to cuts in import tariffs or other trade taxes may generate further fiscal instability exacerbating their deficit thus worsening their already weak macroeconomic

[3]See IMF (1997) for a detailed explanation and review of case studies.

status. This represents an important element because macroeconomic changes play a crucial role in determining the success of a trade liberalization program. For instance, the experience of many of the successfully liberalizing developing countries has shown that the potential trade tax revenues losses following tariff reduction can be offset by a depreciation of real exchange rate.[4] According to Ebrill et al. (1999) trade liberalization in CFA African countries has been proved not to decrease trade tax revenue only after the 1994 devaluation.[5] It is clear that trade interventions in the form of trade restrictions in Africa, more than in any other country, have the aim to protect the economy and generate revenues. These and other peculiar characteristics of the African economies make it very interesting to analyze the revenue consequences of trade liberalization with the aim to provide policy recommendations.

The goal of this paper is to determine whether controlling for macroeconomic features of African economies and taking into account the existence of political constraints that might either support or weaken the power of the trade reform, a change in trade policy proxied by the effective rate of trade taxation has a positive or negative effect on trade tax revenues. As stressed above, the revenue effects of greater openness to international trade depend on several initial conditions. In particular, it is interesting to consider the impact on trade tax revenues of variation in the tariff rates starting from different levels of tariff protection. Thus, in this analysis we also check for the existence of the so called "Laffer effect". As we will point out in next section, the existing empirical literature focused on the revenue consequences of trade trade reforms shows mixed results which stem mainly from substantial differences in the country samples, the econometric methodology used, and different definition of trade restriction measures. We build on the existent empirical literature by making use of a similar set of economic variables such as those describing the macroeconomic environment and the level of development of a country. One of the interesting contributions of this paper is the inclusion of a measure of the credibility of the government that captures whether the impact on tax revenues of a trade reform also depends on the governments ability, related to political constraints, to commit to a policy reform. If we agree that trade liberalization represents a huge challenge in particular for African countries due to the issues we have just mentioned, then this work, based on a panel data set of 53 African countries taken over the period 1970-2000, brings in the original contribution of improving the understanding of the mechanisms underneath

[4]In general, the real effect of a decrease in value of a currency on trade tax revenue cannot be known a priori but considering African countries where the demand for imports is relatively inelastic a devaluation is likely to be revenue enhancing.

[5]The CFA franc devaluation was part of a broad adjusting reform program also supported by the IMF.

trade reforms in such a problematic continent. This paper also wants to show that the contrasting results obtained in previous research efforts have been based on weak estimation methods that did not take into account the crucial bias due to the presence of endogeneity. To do so we make use of sophisticated estimation techniques based on the Generalized Method of Moments (GMM) that allows to control for the bias due to the endogeneity of several of the explanatory variables.

We find that for the sample of countries considered, higher openness to trade although generating benefits in the long run will have dangerous fiscal repercussion in the short run due to the potential reduction in trade tax revenues induced by a reduction in import tariffs. We also detect the existence of a Laffer effect which signals that a further decrease in tariff reduction would lead to a further decrease in trade tax revenue in African economies. We also conclude that a devaluation of the domestic currency able to offset at least part of the potential losses in trade tax revenues would represent a valid strategy that should accompany trade openness reforms. Along with these three major findings we stress the importance of both a stable economic environment and a credible government in explaining the ability of a country to collect trade tax revenues.

The paper is organized as follows. The next session illustrates the results of the recent empirical literature on the relationship between trade liberalization and taxation outcomes. Section 3 describes the dataset, giving a detailed explanation of the explanatory variables used in the applied work, and the econometric methodology applied in the empirical analysis. Section 4 shows the main results and their robustness with respect to different estimation methodology and finally, section 5 concludes.

2 Trade reform and tax revenues: the evidence so far

Given the complexity in the implementation of a trade opening reform it is generally claimed that the revenue effects of trade liberalization can be evaluated only through empirical analysis. Some recent empirical studies have attempted to explain whether trade liberalization has resulted in a fiscal hurdle due to a severe reduction in tax revenue, mainly linked to a sharp decrease in custom duties collection, or if greater international trade openness experienced by several developing countries has had a positive impact on tax revenue. The results obtained through empirical research do not always go in the same direction, leaving the floor open to further investigation, but also leaving policy makers

with weak policy implications.

Notwithstanding the theoretical argument for a simultaneous tariff and domestic tax system reform [6], establishing that any tariff reduction with a simultaneous price-neutral consumption tax (i.e. VAT) will enhance both welfare and net revenue (despite unchanged consumer prices negating a large part of the gains from trade liberalization), there exists a considerable controversy with respect to the feasibility of such a strategy in developing countries whose ability to replace tariffs with a more sophisticated and well functioning domestic taxation system has been questioned on structural and political-economy grounds. Assessing the extent to which low-income countries that have implemented significant tariff reforms while simultaneously trying to replace the forgone tariff revenue with other taxes is a difficult task. First, the quality of government finance data in developing countries is a serious concern. Second, analysing the simple trends of trade tax and non-trade tax revenues, as it has been done in some studies, may be misleading. This is especially the case given that conclusions drawn from simple correlations are not conditioned to the observed changes on relevant macroeconomic variables. Keen and Baunsgaard (2004), attempted to correct this shortcoming by econometrically investigating whether in practice countries have been able to recover the losses from trade taxes with revenues from other sources conditioning the relationship between the share of trade and non-trade tax revenue on a number of macroeconomic indicators. They find that, in the low income country-group in their sample, a reduction in trade tax revenues has been accompanied by a trend reduction in total tax revenues.

Agbeyegbe et al. (2004), find timid positive relation between openness and either trade tax revenue and total tax revenue in Sub-Saharan countries. In particular, they find that the relationship between trade liberalization and tax revenue is sensitive to the measure used to proxy trade. They conclude that trade liberalization accompanied by an appropriate monetary and exchange rate policy does not have a significant effect on overall tax revenue though it may have some (positive) effect on income tax revenue. Contrary to this result, Khattry and Rao (2002) find that the decline in trade tax revenue due to reduced tariff protection joint with the inability of the government to collect revenue from domestic taxation causes a decrease in total tax revenue. They also discover the existence of a Laffer effect which in accordance to this result indicates that the low-income countries included in their data set are operating on the rising part of the Laffer curve. In line with the results found in Khattry and Rao (2002), a recent article from the ATPC (African Trade Policy Centre, 2004) , shows that a reduction of the effective rate of trade taxation is followed

[6] See Keen and Ligthart (2002) for a detailed discussion.

by a decrease in tax revenue because the potential increase in tariff collection that higher trade volumes may lead to as a result of tariff cuts in most cases is insufficient to outweigh the revenue-dampening effect of the tax reductions. Still, in accordance with the results in Khattry and Rao (2002) and Ebrill et al. (1999) this work provides evidence of the existence of a Laffer effect. In particular the authors show that many economies, as a consequence of the liberalization carried out during the 1990s, are now operating on the upward sloping side of the Laffer curve, meaning that a further reduction of trade restrictiveness would generate reduction in revenues.

Adam et al. (2001) investigated the relationship between tax revenue, exchange rate and openness in Sub-Saharan Africa employing dynamic panel techniques. They find that openness raises overall tax revenue in CFA franc[7] countries while it has little effect in non-CFA franc countries. The positive effect is mainly driven by increased trade tax revenues while goods and services tax revenues are actually lowered.

3 Methodology, data-set and variables

Our empirical investigation is based on a panel data-set of annual observations on 53 African countries (see the Appendix for the list of countries) taken over the period 1970-2000. The panel data set is the result of data collection from a number of different sources. The data related to the different sources of tax revenues are taken from the World Bank African Database (WBAD) while most of the remaining economic data are taken from the WDI-2004 World Bank data-set. Political data are taken from the Database of Political Institutions (DPI), the Cross-National Time-Series Data Archive (CNTS), and Polity IV data set. The appendix provides a precise description of data sources and variable construction. In the following subsection we briefly describe the choice of the measure of trade openness and of the other variables used in the empirical analysis.

3.1 How do we proxy trade openness / restriction ?

One of the main problems a researcher has to face when trying to explain the relationship between trade liberalization and tax revenue is the choice of the trade openness/restriction measure to use in the analysis. In the literature different types of measures of trade openness or trade restriction have been considered and none of them is safe from critiques. After the work of Rodriguez

[7]The currency used by a group of countries in West and Central Africa.

and Rodrik (1999), the measures that are mainly used in empirical research are the effective rate of trade taxation and the collected tariff rate.

The effective rate of international trade taxation which is the index we use in this paper is measured by the ratio of international trade taxes to the volume of international trade in imports and exports. This is an index of trade restriction and measures how closed a trade regime is. Thus, as explained in Khattry (2001), a drop in the index indicates greater trade liberalization, while a rise in the index of trade restrictiveness indicates that economies have become more closed as trade taxes relative to trade volumes have risen. This index gives an idea of "realized" tariffs because the measure is based on how much tariff revenue is actually collected. The measure will differ from official tariffs because of imperfect collection and measurement errors. Although this measure is recognized as a good proxy for trade restriction, it does have some shortcomings. In particular, this index ignores the Laffer Effect by underestimating the effect of extremely high tax rates that result in little revenue and ignores the role of smuggling and other practices undertaken to evade taxes. In addition, the index might judge an economy as becoming more restrictive when it might become more liberal. This will occur when countries convert quotas into equivalent tariffs. Nonetheless, given that changes in the denominator (trade volume) reflect the net effect of all policy and exogenous changes, the index implicitly incorporates the effects of changes in all trade barriers. Moreover, the use of the effective rate of international trade taxation can be strongly justified given the widespread data availability and the likelihood that error measurement will be less than with other measures used in the literature.[8]

The second measure is the collected tariff rate. This is measured by the ratio of import duties to the value of imports. Therefore, this measure does not consider the export component of taxes and trade. Also in this case, a decline in the index is taken to indicate greater trade openness.[9]

Another measure which is often used to proxy trade openness is the traditional measure of international trade as a share of GDP. In this case, a higher ratio is taken to indicate a more opened trade regime. This measure, though, has been object of critiques by many authors stemming from the fact that imports and exports cannot be considered as exclusively due to trade policy. In fact as stated by Rodrik (2000) *"policy-makers do not directly control the level of trade...the tools at the disposal of governments are tariff and non-tariff barriers, not import or export levels".*

[8]See the work of Dollar (1992), Pritchett (1996), Spilimbergo et al. (1999), Leamer (1988), Hiscox and Kastner (2002) and Wacziarg and Welch (2005) for a detailed description of alternative proxies of trade openness.

[9]For a discussion see Ebrill et al. (1999).

3.2 Dependent variable

The goal of this paper is to determine whether controlling for macroeconomic stability of the economy and taking into account the existence of political constraints that might either support or weaken the power of the trade reform, a decrease in trade restriction proxied by the effective rate of trade taxation has a positive or negative effect on trade tax revenue. Thus, the dependent variable of the main regression is represented by the trade tax revenue-to-GDP ratio (Tr), where taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes.

3.3 Explanatory variables

The level of development and the structure of the economies under analysis are described by the following variables.[10]

GDP per capita (Gdppc). Per capita GDP is included to capture the level of development of a country. The underlying rationale is that higher income countries tend to have a more monetized economy and better tax administration, so GDP per capita is expected to have a positive relationship with the overall tax revenue to GDP ratio and its domestic tax components, and a more ambiguous relationship with trade tax revenue. Khattry and Rao (2002) explain that contrary to what it should be expected, there might be a positive relationship between trade tax revenue and per capita GDP due to the fact that in low-income countries the income levels are so low that a higher income might facilitate increased trade and thus higher trade tax revenue.

Agriculture and industry as share of GDP (Agri, Indu). This two variables are used to characterize the structure of the production system of a country. They can also be used to proxy the difficulties encountered by a low-income country to collect revenue from domestic taxation. In many African economies agricultural activities are organized on a small-scale basis which make them difficult to be taxed by the government. Thus, the share of agriculture is used as a proxy to control for the difficulty in collecting taxes from this sector. The industrial share in low income countries is used to proxy for mining share.

Urban population (Urban). As pointed out by part of the existing literature, a greater degree of urbanization generates either a greater need for public services, hence increasing the need for tax revenue, and a greater capacity to

[10]See the appendix for a detailed description of these variables.

tax given that it will lead to an enlargement of the taxable base as a result of the concentration of economic activity in urban areas (Edwards and Tabellini, 1992). Urban population is also informative from a political point of view. In particular it could incorporate information on the likelihood of a trade reform to take place. Ancharaz (2003) claims that the urban population includes a fairly large number of civil servants who derive their rents by administering import controls and employee of heavily protected manufacturing sectors who would be threatened by import liberalization. On the other hand, since most imports to Africa are consumed in urban areas, it is fair to assume that high trade restrictions that result in high living costs and a limited access to imported goods will lead to the creation of groups lobbying in favor of import liberalization.

In addition, we include macro variables according to the argument that the macroeconomic environment (in particular macroeconomic stability) plays a substantial role in the trade tax revenue outcome of trade policy reforms.

Real effective exchange rate (Reer). A devaluation of the exchange rate is often a sound trade reform accompanying action. A devaluation of the exchange rate translates directly into changes in domestic collections on imports and exports helping the economy to obviate balance of payment problems following tariff reduction. Given that in the short run aggregate elasticities of import demand [11] might be quite inelastic because domestic consumers might take some time to adjust their consumption choices to the new environment, the valuation effect (the effect due to higher domestic currency value of imports) might dominate the volume effect (the negative effect on trade revenue due to the fall in imports), generating an increase in revenues from imports.

Inflation (Infla). A complete empirical investigation should take into account the effect of changes in macroeconomic variables on trade tax revenues. As claimed above, trade liberalization is often accompanied by currency devaluation which might lead to higher inflation. By introducing inflation between the regressors we are able to control for the effect of an increase in revenues from export taxation due to an increase in export value ceteris paribus (i.e. for the same export level) as a consequence of higher inflation.

Aid per capita (Aid). Aids from international institutions can play an important role when a country decides to open up its economy to international trade. In the presence of structural administration problems that prevent the

[11] See Kowalsky, 2005, p.31.

government from collecting tax revenues from domestic taxation and in the case in which trade liberalization leaded to a loss in trade and total tax revenue, aids from the international community in the form of either loans or grants would represent, in particular for African countries, a significant form of alternative financing.

Government consumption (Govcon). It might be expected that government consumption would be positively correlated with revenues, or some components of it. With the inclusion of government consumption we control for the possibility that countries undertaking liberalization, taking into account the difficulties of the public system to improve its administration capacity and to improve revenue collection via domestic taxation, might think to buffer the potential decrease in trade tax revenue by reducing their expenditure.

Public debt (Debt). We use total central debt as share of GDP as a control variable which embodies the financial status of a country as a whole. Given the economic environment in African countries, we assume that the higher the level of debt the higher the reliance on trade tax revenues. Thus, the higher the difficulties in reducing trade tariff barriers.

In order to capture the ability and the strength with which a government can implement a trade policy and a fiscal policy reform we do also consider a measure of checks-and-balance borrowed from the political economy literature. In particular we will show results obtained using the political constraint index *Polconv* which estimates the feasibility of policy change in a country.

Total population (Pop). As it is usually done in the empirical literature, we introduce the level of total population in order to control for the existence of scale effects.

3.4 Methodology

In our analysis is important to use an estimation method that allows to control for the bias due to the endogeneity of several of the explanatory variables. In particular, it is reasonable to presume that in the equation for the share of trade tax revenue on GDP (Tr), the variables related to government policy decisions such as government consumption ($Govcon$) and the measure of trade restriction (Itr) as well as some variables describing the macroeconomic environment ($Reer$) are likely to be endogenous. Taking this into account, we first test for the endogeneity of these explanatory variables and then start our

analysis using a generalized method of moments (GMM) framework. Different GMM frameworks, such as the Arellano and Bond (1991), Arellano and Bover (1995) and the Arellano and Honore' (2000) methods, have been used in previous works in order to take the endogeneity problem into account. In our study we will use three different types of GMM estimators in order to support our results with a strong and complete econometric strategy.

The first set of estimation results we show in the next paragraph is based on a fixed-effects two-step efficient GMM estimator of the panel data model with endogenous regressors. This GMM estimator is able to generate efficient estimates of the coefficients in the presence of both arbitrary heteroskedasticity and arbitrary autocorrelation as well as consistent estimates of the standard errors. The efficiency gains of this estimator relative to the traditional IV/2SLS estimator derive from the use of an optimal weighting matrix, the overidentifying restrictions of the model, and the relaxation of the i.i.d. assumption. In other words, final coefficient estimates are obtained by firstly estimating the model using IV in order to get residual from which it is possible to estimate the optimal weighting matrix that is successively used in the second step to calculate the coefficient GMM estimator and its variance-covariance matrix.[12]

The second econometric approach implemented in this paper is based on a dynamic panel-data model, the "Arellano and Bond GMM" estimator (first-difference estimator), which includes the lagged dependent variable as regressor. The innovation introduced by Arellano and Bond is based on the idea that additional instruments can be obtained in a dynamic panel data model if one utilizes the orthogonality conditions that exist between lagged values of the dependent variable and the disturbances. Arellano and Bond (1991) derived a GMM estimator for all the coefficients in the differenced equation of the original model which, given that random effects are removed after first differencing, is estimable by IV. As valid instrumental variables they use, since they are correlated with the right hand side variables but uncorrelated with the first-differenced idiosyncratic error term, lagged levels (one period lag in our analysis) of the dependent variable, lagged levels (two or more periods) of the endogenous variables, lagged levels (one or more periods) of the predetermined variables and differences of the strictly exogenous variables. Then, using the GMM framework it is possible to identify how many lags of the dependent, of the predetermined, and of the endogenous variables are valid instruments, and how to combine these lagged levels with first differences of the strictly exogenous variables into a potentially very large instruments matrix by which, performing GLS, the preliminary one-step consistent estimators are derived.

The third GMM estimator we consider is an extension of the Arellano

[12]Baum, Schaffer and Stillman (2003) explain this estimation procedure in details.

and Bond dynamic panel-data just described. It is a one-step system GMM estimator, first outlined by Arellano and Bover (1995) and fully developed by Blundell and Bond (1998). The extension with respect to the Arellano and Bond estimator is that the so called "System-GMM" introduces lags of first differences predetermined and endogenous variables as further instruments for predetermined and endogenous variables in levels. Moreover, we specify a set of variables to be used as bases for the "GMM-style" estimator described in Holtz-Eakin, Newey, and Rosen (1988) and Arellano and Bond (1991). For each time period, the estimator uses all available lags of the specified endogenous variables in levels dated *(t-1)* or earlier as instruments for the first-difference equations and uses the contemporaneous first differences as instruments in the levels equations. In the specification we adopt for the GMM component of this estimator we decide to make use only of the full set of available moment conditions for the levels equations.

3.5 Instrumental variables

When implementing the fixed-effects two-step efficient GMM estimator of the panel data model we add to the internal set of instruments (the exogenous variables in the regression) extra instrumental variables satisfying the property of being uncorrelated to the error term but correlated with the endogenous variables they have to instrument. Finding good instruments represents a hard task, sometimes an art. Our choice of instruments is in line with what it is frequently done in the empirical literature. We use the lagged values of the endogenous variables up to time *(t-2)*. As showed in table 2 our assumption on the endogeneity of the index of trade restriction (Itr), government consumption $Govcon$, and real effective exchange rate ($Reer$) is supported by the outcome of the endogeneity test we run. We are also comforted on the validity of our chosen instruments by the outcome of the Hansen J-test for overidentifying restriction which tells us that altogether our instruments are valid.

4 Econometric results

In this section we present the results obtained through the three different GMM estimators described in the previous paragraph.

Table 1 reports the coefficient estimates of the following baseline regression obtained from two-step efficient GMM estimator:

$$Tr = \alpha_1 Itr_{it} + \alpha_2 Itr2_{it} + \alpha_3 Govcon_{it} + \alpha_4 Reer_{it} + \alpha_5 Pop_{it} + \alpha_6 Gdppc_{it} + \alpha_7 Infla_{it} + \alpha_8 Agri_{it} + \alpha_9 Indu_{it} + \alpha_{10} Urban_{it} + \alpha_{11} Polconv_{it} + \alpha_{12} Debt_{it} + \mu_i + \varepsilon_{it}$$

The estimate coefficient for *Itr* indicates a positive relation between the index of trade restriction and the dependent variable (*Tr*) meaning that a reduction in trade taxes leads to a reduction in trade tax revenues. This result, for sign and magnitude, is in line with the one obtained by Khattry and Rao (2002) who also find a large trade-off between reduced trade tax revenue and reduced protection. The squared of the index of trade restriction (*Itr2*) has been introduced assuming a non linear relationship between the effective rate of trade taxation and costums revenue in order to control for the existence of a Laffer effect between those two variables. The negative and statistically significant estimate coefficient associated to *Itr2* informs us that a Laffer effect is actually present between African economies, meaning that further reduction in tariff protection will lead to an even more drastic reduction in trade tax revenues collection. Khattry and Rao (2002) obtain an equivalent result considering low-income countries concluding that this group of countries have been operating on the rising part of the Laffer curve. The coefficient on the real effective exchange rate (*Reer*) has negative sign suggesting that a depreciation raises trade tax revenue. We know, that many African countries, in particular the CFA countries [13], have devalued their currency during the period under analysis using macroeconomic policies to assist trade liberalization. Moreover, as figure 3 shows, export taxes are lower and less significant than import taxes in Africa. Thus, the negative relationship between the real effective exchange rate and the costum duties over GDP ratio, is due to the fact that aggregate elasticities of import demand are inelastic in these countries (where a large share of imports consists of price-ineleastic goods without domestic substitutes [14]) so that the valuation effect (the increase in the value of imported goods in local currency terms as the exchange rate depreciates) dominates the volume effect, leading to an overall increase in revenues from imports. The results obtained for inflation (*Infla*) and public debt (*Debt*), although small in magnitude, show that countries characterized by an unstable economic environment typically have a higher trade tax revenue to GDP ratio. Thus, there is evidence that structural factors play a significant role in determining trade tax revenue. In fact, while an increase of one percentage point in the urbanization rate (*Urban*) leads to an increase of 0.22 percentage points in the costums revenue, the estimate coefficient on population size (*Pop*) shows the existence of a negative scale effect. The result on *Urban* can be explained considering that as urban population increases trade tax revenues might increase due to the fact that the needs of people living in this areas have different needs and

[13]The CFA frank was overvalued before the sharp depreciation occurred in 1994.

[14]See Ebrill et al. (1999).

habits compared to people living in rural areas, needs that possibly can be satisfied through imports. The insignificance of coefficients on GDP per capita (*Gdppc*) is likely to be due to the fact that the sample considered is composed of low-income countries only.

The positive relationship between the index of political constraint *Polconv* and the dependent variable (*Tr*) leads us to the conclusion that an increase in the credibility of a trade reform, due to the presence of higher and more sophisticated measures of "checks and balances" in action during the discussion and the decision over a new trade policy, leads to an increase in trade tax revenue.

In order to provide further evidence on the validity of these results in table 2 we show the outcome of a series of tests aimed at verifying the validity of the estimation method used and the robustness of the upshots obtained. We run a difference-in-Sargan statistic to verify the endogeneity of the measure of trade restrictiveness (*Itr* and *Itr2*), the real effective exchange rate (*Reer*) and the measure of government consumption (*Govcon*). The endogeneity test is based on the null hypothesis that the specified endogenous regressors can actually be treated as exogenous. This endogeneity test is defined as the difference of two Hansen-Sargan statistics: one for the equation with the smaller set of instruments, where the suspect regressors are treated as endogenous, and one for the equation with the larger set of instruments, where the suspect regressors (suspect endogenous variables) are treated as exogenous.[15] We reject the null hypothesis that the specified endogenous regressors can actually be treated as exogenous. This outcome allows us to fully justify the adoption of a GMM estimation method. The essence of GMM is to utilize instruments (or orthogonality conditions) in an optimal way in cases where there are more instruments than endogenous variables (overidentification). Thus, it is key to test whether the equation to estimate is underidentified, just-identified or overidentified, or put it in another way, whether the excluded instruments (predetermined regressors) are relevant. We verify this by mean of the Anderson canonical correlation likelihood-ratio test based on the null hypothesis of underidentification.[16] We reject the null of underidentification concluding that the equation is at least identified and that the instruments are relevant.[17]

[15]The estimated covariance matrix used guarantees a non-negative test statistic, see Baum et al. (2003).

[16]We test whether the matrix of reduced form coefficients has $rank = K - 1$, where K is the number of regressors. The relevant statistic is distributed as a chi-squared with degrees of freedom equal to *(L - K - 1)* where L is the number of both included instruments (*Pop, Gdppc, Infla, Agri, Indu, Urban, Aid, Polconv* and *Debt* and excluded instruments represented by their own lags.

[17]Nonetheless, we are aware of the claim made by Hall et al. (1996) who warn that a result of rejection of the null should be treated with caution, because weak instrument problems

Table 1: Trade tax revenues and trade liberalization: IV-GMM.

	IV-GMM
Index of Trade Restriction (Itr)	0.682***
	(0.16)
Index of Trade Restriction squared (Itr2)	-0.014**
	(0.01)
Government Consumption (Govcon)	-0.074**
	(0.03)
Real Effective Exchange Rate (Reer)	-0.027***
	(0.00)
Public Debt (Debt)	-0.003**
	(0.00)
Political constraint (Polconv)	0.733***
	(0.24)
GDP per capita (Gdppc)	-0.603
	(0.74)
Agriculture (Agri)	-0.008
	(0.01)
Industry (Indu)	-0.002
	(0.01)
Population (Pop)	-3.213***
	(0.97)
Inflation (Infla)	0.005**
	(0.00)
Urban population (Urban)	0.224***
	(0.07)
Aid per capita (Aid)	0.112
	(0.15)
R-squared	0.60
No. of Obs.	242

Note: Dependent variable is trade tax revenues over GDP (annual data over the period for 1970-2000. Estimation is panel IV-GMM, *Itr, Itr2, Govcon* and *Reer* have been instrumented with their own lags and included exogenous variables. Heteroskedasticity robust standard errors reported in parentheses. ***,**,* denote significance at the 1, 5 and 10 percent levels respectively.

We further check the validity of the instruments via the Hansen-Sargan test. A test of overidentifying restrictions. The joint null hypothesis is that the instruments are uncorrelated with the error term and the excluded instruments (lags up to time $(t-2)$ of the endogenous variables) are correctly excluded from the estimated equation. Considering that we are using an efficient GMM estimator, the test statistic is the Hansen's J-statistic.[18] We fail to reject the null hypothesis, confirming the overall validity of the instrumental variables. Finally, we control for the validity of the assumption that the regressors defined as included instruments and introduced in the equation to model the macroeconomic environment (i.e. inflation , GDP per capita and public debt) can actually be treated as exogenous. We implement a C-statistic[19] on a subset of the orthogonality conditions defined as the difference of the Hansen-Sargan statistic of the equation with the smaller set of instruments and the equation with the full set of instruments which includes also the instruments whose validity needs to be checked. Under the null hypothesis that both the smaller set of instruments and the additional, suspect instruments are valid, the C statistic is distributed as chi-squared in the number of instruments tested. We fail to reject the null hypothesis that the full set of orthogonality conditions is valid coming to the conclusion that the included instruments are actually exogenous and valid instruments.

Table 2: Test of endogeneity and exogeneity

Test	Test Description	P-Value
Difference-in-Sargan Statistic	Endogeneity test	0.0360
Anderson corr. LR statistic	Identification/IV relevance	0.0000
Hansen J Statistic	Overidentification test	0.4853
Difference-in-Sargan Statistic	Exogeneity test	0.8886

Note: Instrumented: *Itr*, *Itr2*, *Govcon* and *Reer*; Included instruments: *Pop*, *Gdppc*, *Infla*, *Agri*, *Indu*, *Urban*, *Aidpc*, *Polconv* and *Debt*; Excluded instruments: *Itr(t-1)*, *Itr2(t-1)*, *Govcon(t-1)*, *Reer(t-1)*, *Itr(t-2)*, *Itr2(t-2)*, *Govcon(t-2)* and *Reer(t-2)*

In what follows we present the results we obtain using the alternative GMM estimators described above. Table 3 and table 5 show the results for the "System GMM" and "Arellano and Bond GMM" estimation methods, respectively.

The comparison of the results obtained with these two estimation techniques with the results reported in table 7 allows us to understand whether our results are consistent and robust. Moreover, given that both the "Arellano

may still be present.

[18]The minimized value of the GMM criterion function.

[19]Also known as "GMM distance" or "difference-in-Sargan" statistic.

Table 3: Trade tax revenues and trade liberalization: System GMM.

	System GMM
Trade Tax Revenues(t-1) (Tr(t-1))	0.468***
	(0.03)
Index of Trade Restriction (Itr)	0.386***
	(0.04)
Index of Trade Restriction squared (Itr2)	-0.008***
	(0.00)
Government Consumption (Govcon)	0.018*
	(0.01)
Real Effective Exchange Rate (Reer)	-0.008***
	(0.00)
Public Debt (Debt)	-0.001*
	(0.00)
Political constraint (Polconv)	0.332*
	(0.17)
GDP per capita (Gdppc)	-0.069
	(0.08)
Agriculture (Agri)	-0.034***
	(0.01)
Industry (Indu)	-0.007
	(0.01)
Population (Pop)	-0.363***
	(0.06)
Inflation (Infla)	0.003**
	(0.00)
Urban population (Urban)	0.043***
	(0.01)
Aid per capita (Aid)	0.231***
	(0.06)
Constant	1.457*
	(0.82)

Note: Dependent variable is trade tax revenues over GDP (%), annual data over the period for 1970-2000. Estimation is System-GMM. Heteroskedasticity robust standard errors reported in parentheses. ***,**,* denote significance at the 1, 5 and 10 percent levels respectively.

Table 4: Test of endogeneity and autocorrelation: "System GMM"

Test Description	P-Value
Sargan test of overid. restrictions	0.980
(*) Arellano-Bond test for AR(1)	0.000
(**) Arellano-Bond test for AR(2)	0.183

Note: (*) Arellano-Bond test for autocorrelation of order 1 in differenced residuals; H0: no autocorrelation. (**) Arellano-Bond test for autocorrelation of order 2 in differenced residuals; H0: no autocorrelation.

and Bond" and the "System-GMM" estimators contemplate the lag of the dependent variable among the regressors, we are able to control for the persistence in the trade tax revenues which characterize African economies. Independently from the method used to estimate the equation representing the effect of trade liberalization on trade tax revenue, the coefficient estimates of the measure of trade restrictiveness (*Itr*) other than having a similar magnitude always show a positive sign and are highly statistically significant (99% level). Also the coefficient estimates of the squared of the effective rate of international trade taxation. (*Itr2*), which are significant at the 99% level in the case of "System GMM" and "Arellano and Bond GMM", show a similar magnitude and the same negative sign confirming the existence of a Laffer effect. The same conclusion holds in the case of the coefficient estimates *Reer* and *Infla*. In fact, the real effective exchange rate keeps showing a negative sign and a similar magnitude while the measure of inflation shows a positive sign, similar magnitude and statistical significance (although at different levels) independently from the choice of the estimator. In the case of population size (*Pop*) and share of urban population (*Urban*) the coefficients estimates maintain the same sign, negative and positive respectively, are statistically significant even though at different level of significance, but show different magnitude depending on the estimator applied. Considering all the independent variables in the regressions, only the estimated coefficient for the share of industrial activities (*Indu*) and per capita GDP (*Gdppc*) turn out to be never significant. Nonetheless, (*Indu* maintains the same negative sign and magnitude under all the three estimators. The coefficient estimates of agriculture share (*Agri*), aid per capita (*Aidpc*), the index of political constraint *Polconv* and public debt *Debt* are not always statistically significant independently on the type of estimator adopted. For example, the coefficient estimates on agriculture share, which show the same negative sign and the same magnitude under the three estimation methods, turns out to be statistical significant (at the 99% level) only in the results obtained through "System GMM". In the case of aids per capita, statistical significance still emerges only in the case of "System GMM", but in this case,

Table 5: Trade tax revenues and trade liberalization: Arellano and Bond.

	Arellano and Bond (AB)
Trade Tax Revenues (t-1) (Tr(t-1))	0.151*
	(0.032)
Index of Trade Restriction (Itr)	0.435*
	(0.042)
Index of Trade Restriction squared (Itr2)	- 0.006*
	(0.001)
Government Consumption (Govcon)	- 0.022***
	(0.013)
Real Effective Exchange Rate (Reer)	- 0.013*
	(0.001)
Population (Pop)	- 1.789***
	(0.954)
GDP per capita (Gdppc)	0.191
	(0.346)
Inflation (Infla)	0.002**
	(0.001)
Agriculture (Agri)	- 0.011
	(0.008)
Industry (Indu)	0.006
	(0.008)
Urban population (Urban)	0.134**
	(0.053)
Aid per capita (Aid)	0.092
	(0.073)
Political constraint (Polconv)	0.059
	(0.197)
Public Debt (Debt)	-0.0003
	(0.000)

Note: Dependent variable is trade tax revenues over GDP (%), annual data over the period for 1970-2000. Estimation method is one-step Arellano and Bond GMM. Heteroskedasticity robust standard errors reported in parentheses. ***,**,* denote significance at the 1, 5 and 10 percent levels respectively.

Table 6: Test of endogeneity and autocorrelation: AB "difference GMM".

Test Description	P-Value
Sargan test of overid. restrictions	1.000
(*) Arellano-Bond test for AR(1)*	0.000
(**) Arellano-Bond test for AR(2)**	0.815

Note: (*) Arellano-Bond test that average autocovariance in residuals of order 1 is 0; H0: no autocorrelation. (**) Arellano-Bond test that average autocovariance in residuals of order 2 is 0; H0: no autocorrelation.

although the coefficient estimates keep the same positive sign, the magnitude of the coefficients are similar only in the cases of "Fixed Effects GMM" and "Arellano and Bond GMM". The variable *Polconv*, instead, keeps always the same positive sign but it is statistical significant and show similarity in the magnitude only when either the "Fixed Effect GMM" or the "System GMM" are implemented. The coefficient estimates on government consumption (*Govcon*), although always statistically significant (from 90% to 95% significance level), show different outcomes in terms of sign and magnitude. It shows a negative sign in the case of "Fixed Effects GMM" and "Arellano and Bond GMM" estimators but a positive sign when the "System GMM" is applied. Moreover, the coefficients show different magnitudes according to the estimation technique applied. Altogether, a part from the differences listed above, we can conclude that our results are fairly stable across different estimation methods thus confirming the robustness of the main findings and conclusions reported in table 1.

Tables 4 and 6 report the outcomes of the Arellano and Bond tests for autocorrelation and the Sargan test for over-identifying restrictions, for the "System" and the "Difference" estimator respectively. Arellano and Bond developed a test for autocorrelation of first and second order in the first differenced residuals.[20] They state that autocorrelation of order 1 (AR(1)) is expected in first differences, because $\Delta\epsilon_{i,t} = \epsilon_{i,t} - \epsilon_{i,t-1}$ should correlate with $\Delta\epsilon_{i,t-1} = \epsilon_{i,t-1} - \epsilon_{i,t-2}$ since they share the $\epsilon_{i,t-1}$ term. Therefore, to check for AR(1) in levels, they propose to look for AR(2) in differences, on the idea that this will detect the relationship between the $\epsilon_{i,t-1}$ in $\Delta\epsilon_{i,t}$ and the $\epsilon_{i,t-2}$ in $\Delta\epsilon_{i,t-2}$. Autocorrelation indicates that lags of the dependent variable (and any other variables used as instruments that are not strictly exogenous), are in fact endogenous, thus bad instruments.[21] Moreover, while the presence of

[20] Autocorrelation of first and second order in the first differenced residuals imply respectively: $E[\Delta\epsilon_{i,t}\Delta\epsilon_{i,t-1}] \neq 0]$ and $E[\Delta\epsilon_{i,t}\Delta\epsilon_{i,t-2}] \neq 0$.

[21] For example, if there is AR(s), then $y_{i,t-s}$ would be correlated with $\epsilon_{i,t-s}$, which would be correlated with $\Delta\epsilon_{i,t-s}$, which would be correlated with $\Delta\epsilon_{i,t}$.

Table 7: Trade tax revenues and trade liberalization: comparing results.

	IV-GMM	System GMM	AB
Trade Tax Revenues(t-1) (Tr(t-1))		0.469***	0.151*
		(0.03)	(0.032)
Index of Trade Restriction (Itr)	0.682***	0.386***	0.435*
	(0.16)	(0.04)	(0.042)
Index of Trade Restriction squared (Itr2)	-0.014**	-0.008***	- 0.006*
	(0.01)	(0.00)	(0.001)
Government Consumption (Govcon)	-0.074**	0.018*	- 0.022***
	(0.03)	(0.01)	(0.013)
Real Effective Exchange Rate (Reer)	-0.027***	-0.008***	- 0.013*
	(0.00)	(0.00)	(0.001)
Public Debt (Debt)	-0.003**	-0.001*	-0.0003
	(0.00)	(0.00)	(0.000)
Political constraint (Polconv)	0.733***	0.332*	0.059
	(0.24)	(0.17)	(0.197)
GDP per-capita (Gdppc)	-0.603	-0.069	0.191
	(0.74)	(0.08)	(0.346)
Agriculture (Agri)	-0.008	-0.034***	- 0.011
	(0.01)	(0.01)	(0.008)
Industry (Indu)	-0.002	-0.007	0.006
	(0.01)	(0.01)	(0.008)
Population (Pop)	-3.213***	-0.363***	- 1.789***
	(0.97)	(0.06)	(0.954)
Inflation (Infla)	0.005**	0.003**	0.002**
	(0.00)	(0.00)	(0.001)
Urban population (Urban)	0.224***	0.043***	0.134**
	(0.07)	(0.01)	(0.053)
Aid per capita (Aid)	0.112	0.231***	0.092
	(0.15)	(0.06)	(0.073)

Note: Dependent variable is trade tax revenues as percentage of GDP, annual data over the period for 1970-2000. Estimation is panel IV-GMM in column 1, System-GMM in column 2 and Arellano and Bond in column 3. In col. 1 *Itr, Itr2, Govcon* and *Reer* have been instrumented with their own lags. Heteroskedasticity robust standard errors reported in parentheses. ***,**,* denote significance at the 1, 5 and 10 percent levels respectively.

second-order autocorrelation in the differenced residuals would imply that the estimates are inconsistent, they show that the estimates are still consistent in the presence of first-order autocorrelation in the first-differenced residuals. In our case, for both estimators, we reject the null of no autocorrelation of order 1 in the differenced residuals, but we cannot reject the null of no autocorrelation of order 2. Therefore, we are comforted with the results that past lags of the dependent and of the other not strictly exogenous variables (lagged variables used to instrument the endogenous variables) are valid instruments thus confirming the consistency of the estimated coefficients. The Sargan test for over-identifying restrictions tests the hypothesis that the instrumental variables are uncorrelated to some set of residuals, and therefore they are acceptable instruments. If the null hypothesis is not rejected the instruments pass the test. As reported in tables 4 and 6, we cannot reject the null that the set of instruments are valid altogether, either for the "System" and the "Difference" estimators.

5 Conclusions

Considering a panel data set on 53 African countries for the period 1970-2000 we empirically analyzed the relationship between trade liberalization and trade tax revenues. Previous empirical studies addressed the same issue, reaching mixed conclusions. The main result of this paper is that there exists a large trade off between a greater degree of openness to international trade and the revenue collected from import and export taxation. This outcome, obtained taking into account a policy measure of trade restriction, countries macroeconomic conditions, the ability of the governments to issue a credible trade reform, initial economic conditions, duties, which represents by far the highest share in government total revenue. Moreover, we also find that the relationship between trade taxes and trade tax revenues is non linear, giving credit to the existence of a Laffer effect. This means that, in aggregate, African countries are operating on the rising side of an inverse U-shaped curve, indicating that a further decrease in tariff reduction can only lead to a further decrease in trade tax revenue. Therefore, an increase in trade openness not accompanied by a strong reform of the domestic taxation system would do more harm than good, because losing revenue from trade taxation without being able to compensate this loss with increased revenue collection from domestic taxation would ultimately decrease total tax revenues, which in turn would result in exacerbating the already more than precarious fiscal deficit and total debt position of these countries. In order to achieve revenue protection after trade liberalization these countries will be due to strength their administrative ability in order to

increase collection from domestic taxation, for example introducing or improving the VAT, and improving direct taxation. If African countries will not meet this goal, this might have negative repercussions on the spending side of the government behavior, with governments reducing important spending items like health, education and social security which will badly effect the poorest segment of the society. We confirm the prediction based on case studies that trade openness reforms should be accompanied by a devaluation of the domestic currency in order not to generate fiscal instability and we support the role of a stable economic environment in facilitating the ability of a country to improve the collection of costum duties. Very interestingly we are also able to conclude that, along with the stability of macroeconomic conditions, the credibility of the policy implemented by the government and its ability to stick to taken decisions might play a role in determining taxation outcome before and after the introduction of tariff reduction measures.

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Appendix

Definition of variables

Trade Tax Revenues (*Tr*): Trade tax revenue as share of GDP (%). Taxes on international trade include import duties, export duties, profits of export or import monopolies, exchange profits, and exchange taxes. Current revenue includes all revenue from taxes and nonrepayable receipts (other than grants) from the sale of land, intangible assets, government stocks, or fixed capital assets, or from capital transfers from nongovernmental sources. It also includes fines, fees, recoveries, inheritance taxes, and nonrecurrent levies on capital. Data are shown for central government only. Calculated from WBAD data.

Index of Trade Restriction (*Itr*): Effective rate of international trade taxation. Measured by the ratio of international trade taxes to the volume of international trade in imports and exports. Calculated from WBAD data.

Index of Trade Restriction squared (*Itr2*): Effective rate of international trade taxation squared. Calculated from WBAD data.

Government Consumption (*Govcon*): Government consumption as share of GDP (%). Government consumption includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and security, but excludes government military expenditures that are part of government capital formation (Source: WDI-2004 World Bank).

Real Effective Exchange Rate (*Reer*): Real effective exchange rate index (1995 = 100). It is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs (Source: WDI-2004 World Bank).

Population (*Pop*): Log of total population. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship–except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin (Source: WDI-2004 World Bank).

GDP per capita (*Gdppc*): Log of GDP per capita (Const. 1995 US$). GDP per capita is gross domestic product divided by midyear population. GDP is the sum of gross value added by all resident producers in the economy plus

any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant U.S. dollars (Source: WDI-2004 World Bank).

Inflation (*Infla*): Percentage change in CPI. Consumer price index reflects changes in the cost to the average consumer of acquiring a fixed basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used (Source: WDI-2004 World Bank).

Agriculture (*Agri*): Agriculture, value added (% of GDP). Agriculture corresponds to ISIC divisions 1-5 and includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3 (Source: WDI-2004 World Bank).

Industry (*Indu*): Industry as share of GDP (%).Industry corresponds to ISIC divisions 10-45 and includes manufacturing (ISIC divisions 15-37). It comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas. Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The origin of value added is determined by the International Standard Industrial Classification (ISIC), revision 3.

Urban population (*Urban*): Urban population (% of total). Urban population is the share of the total population living in areas defined as urban in each country (Source: WDI-2004 World Bank).

Aid per capita (*Aid*): Log of Aid per capita (current US$). Aid per capita includes both official development assistance (ODA) and official aid, and is calculated by dividing total aid by the midyear population estimate (Source: WDI-2004 World Bank).

Political constraint (*Polconv*): Political constraint index. This measure of political constraints estimates the feasibility of policy change (the extent to which a change in the preferences of any one actor may lead to a change in gov-

ernment policy) using the following methodology. First, extracting data from political science databases, it identifies the number of independent branches of government (executive, lower and upper legislative chambers) with veto power over policy change in 234 countries in every year that they existed from 1800 to 2001. The preferences of each of these branches and the status quo policy are then assumed to be independently and identically drawn from a uniform, unidimensional policy space. This assumption allows for the derivation of a quantitative measure of institutional hazards using a simple spatial model of political interaction. This initial measure is then modified to take into account the extent of alignment across branches of government using data on the party composition of the executive and legislative branches. Such alignment increases the feasibility of policy change. The measure is then further modified to capture the extent of preference heterogeneity within each legislative branch which increases (decreases) decision costs of overturning policy for aligned (opposed) executive branches (Source: Henisz (2000).

Public Debt (*Debt*): Central government debt, total (% of GDP). Total debt is the entire stock of direct, government, fixed term contractual obligations to others outstanding at a particular date. It includes domestic debt (such as debt held by monetary authorities, deposit money banks, nonfinancial public enterprises, and households) and foreign debt (such as debt to international development institutions and foreign governments). It is the gross amount of government liabilities not reduced by the amount of government claims against others. Because debt is a stock rather than a flow, it is measured as of a given date, usually the last day of the fiscal year. Data are shown for central government only (Source: WDI-2004 World Bank).

Data source

Variable	Description	Source
Tr	Trade tax revenue as share of GDP (%)	WBAD data
Itr	Effective rate of international trade taxation	WBAD data
Itr2	Effective rate of international trade taxation squared	WBAD data
Govcon	Government consumption as share of GDP (%)	WDI
Reer	Real effective exchange rate index (1995=100)	WDI
Pop	Log of total population	WDI
Gdppc	Log of GDP per capita (Const. 1995 US$)	WDI
Infla	Change in CPI (%)	WDI
Agri	Agriculture, value added (% of GDP)	WDI
Indu	Industry, value added (% of GDP)	WDI
Urban	Urban population (% of total)	WDI
Aid	Log of aid per capita (current US$)	WDI
Polconv	Political constraint index	Henisz (2000)
Debt	Central government debt, total (% of GDP)	WDI

List of countries

Angola	Gabon	Niger
Benin	Gambia The	Nigeria
Botswana	Ghana	Rwanda
Burkina Faso	Guinea	Sao Tome and Principe
Burundi	Guinea	Senegal
Cameroon	Guinea-Bissau	Seychelles
Cape Verde	Kenya	Sierra Leone
Central African Republic	Lesotho	Somalia
Chad	Liberia	South Africa
Comoros	Libya	Sudan
Congo	Madagascar	Swaziland
Congo, Democratic Republic	Malawi	Tanzania
Cote d' Ivoire	Mali	Togo
Djibouti	Mauritania	Tunisia
Egypt. Arab Republic	Mauritius	Uganda
Equatorial	Morocco	Zambia
Eritrea	Mozambique	Zimbabwe
Ethiopia	Namibia	

Figures

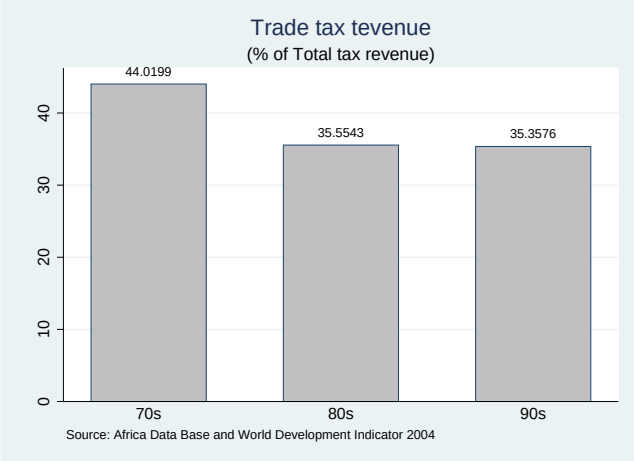

Figure 1: Trade tax revenues and total tax revenues

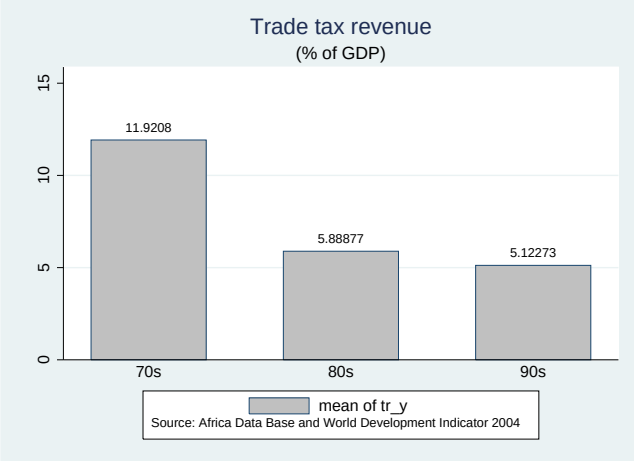

Figure 2: Trade tax revenues and GDP

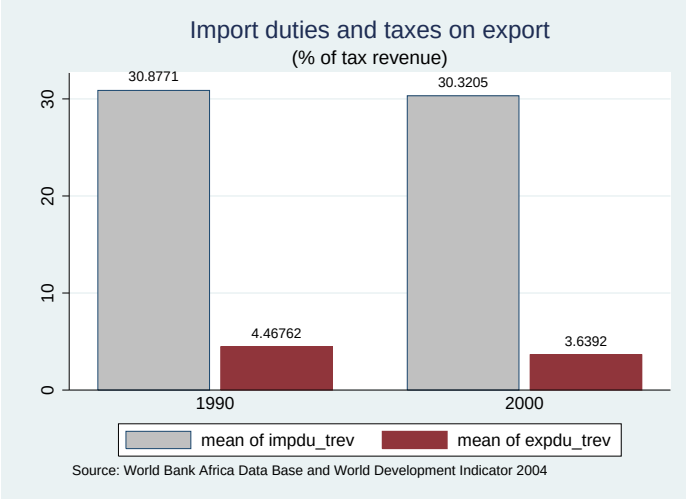

Figure 3: Import duties and taxes on exports as share of Total Tax Revenues

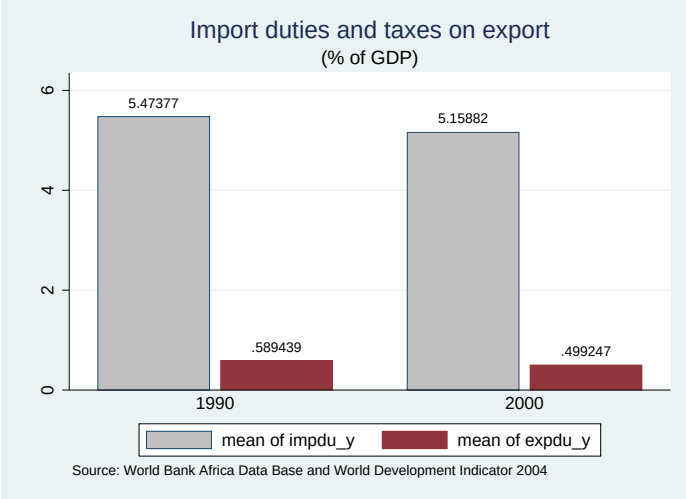

Figure 4: Import duties and taxes on exports as share of GDP